Southeast Alaska Cloudburst Chronicle

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In This Issue:

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Thunderstorms In Southeast Alaska

-By Carl Dierking

Summertime...sunglasses, shorts, swimming and thunderstorms. Well, not as often in Southeast Alaska as other places, but sometimes. Local residents know that our summers are cooler than many areas and often this is cited as the reason for so few thunderstorms, but that's not the whole story. Although the conditions that spawn thunderstorms are more rare, they can occur any time of the year, even winter. For locations along the outer coast like Sitka and Yakutat, thunderstorms actually occur more frequently in the fall and winter months than in spring and summer. ***Please see the accompanying article "Southeast Alaska Thunderstorm Climatology."***

The process that can lead to thunderstorms is actually fairly common in Southeast Alaska, just not as strong. It is called "convection" and it is responsible for the many "showers" that come and go on some days. Convection is a term used specifically to describe conditions that make air rise similar to water boiling in a pot on the stove. A parcel of air that is warmer than its surroundings will rise as nearby air is drawn downward to replace it. The air cools as it rises and eventually, provided there is enough moisture, condenses to form the familiar puffy cumulus clouds. Condensation releases more heat, and the convective process continues to a point where the rising air reaches equilibrium with its surroundings. An atmosphere that is conducive to convection is said to be "unstable."

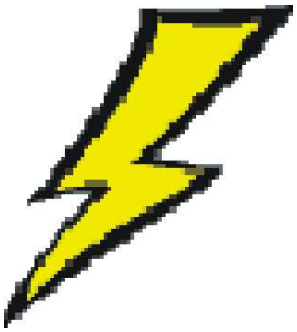
There are two conditions that can lead to an unstable atmosphere and convection. One is caused by strong daytime solar heating that warms the ground and lower atmosphere to the point where air parcels begin to rise. The second is caused by cold air that moves over a comparatively warmer surface and again causes the air in the lower levels to be heated. In Southeast Alaska, where clouds and cool water make it difficult to get enough solar heating for the first condition, the second condition is more common. One example occurs in the winter when intense arctic air from interior Alaska pours into the Gulf of Alaska and spreads eastward to the Panhandle. Water temperatures in the North Pacific are not what we would consider warm, but they are downright tropical compared to the arctic air moving over it.

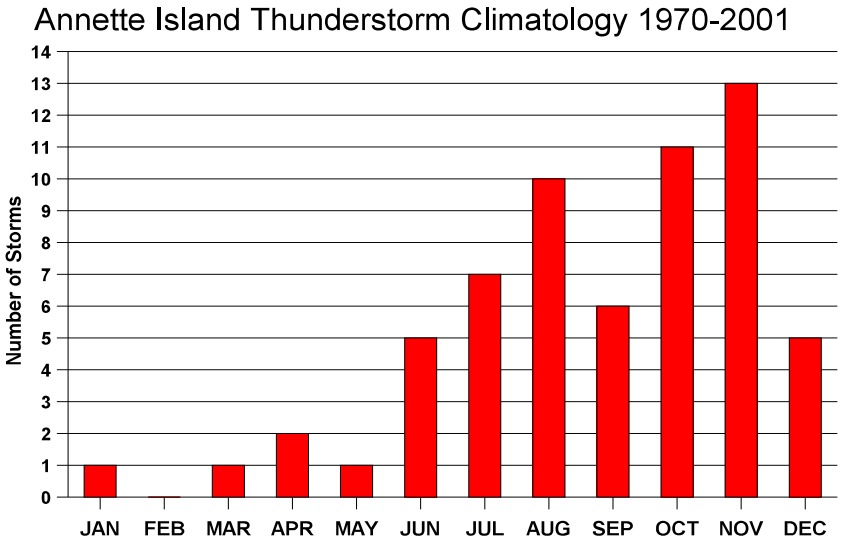
(Continued on page 2)

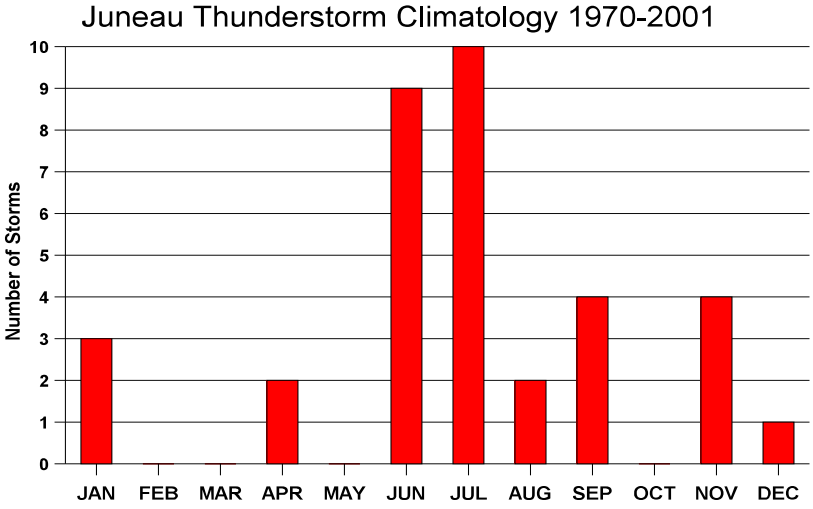
Thunderstorms - cont. from cover

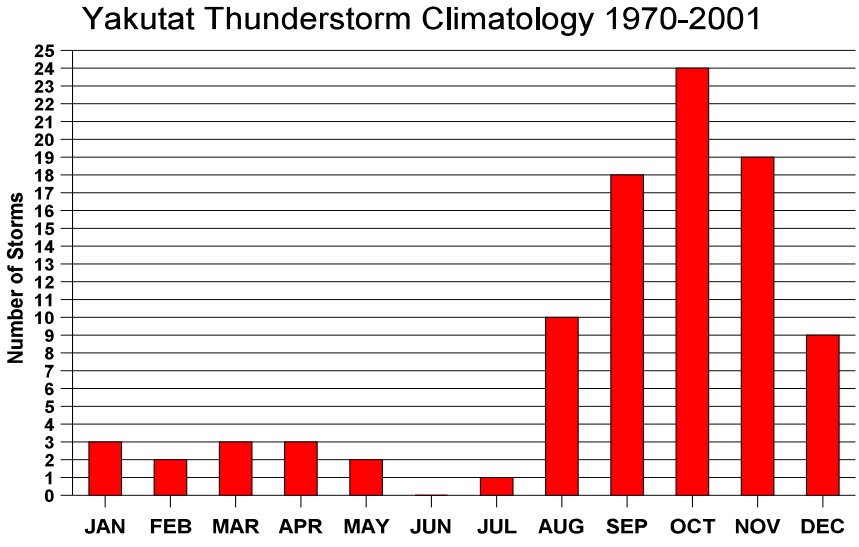
As cumulus clouds develop and the updrafts get stronger, cloud droplets collide, grow, and eventually fall as rain. If convection is deep enough, these clouds can develop to altitudes where water droplets freeze and ice becomes mixed with the rain in strong updrafts and downdrafts. It is believed that collisions with ice crystals and ice particles produce charged ions that collect in different parts of the cloud, negative at the base, and positive at the top. Lightning is simply an electrical discharge that balances the difference between positive and negative charges within the cloud, between two clouds, or between the cloud and the ground. Thunder is an explosion that is heard when atmospheric gases are suddenly heated by the discharge of lightning.

So, the depth of convection is a major factor in determining whether a shower turns into a thunderstorm. In Southeast Alaska, although rare, there are occasions when the atmosphere is unstable enough for thunderstorms to occur, sometimes in surprising ways, like accompanied by snow. If you should happen to see lightning or hear thunder, remember it is just as dangerous here as elsewhere. Be sure to check out all the information on our new lightning web page http://pajk.arh.noaa.gov/lightning.php ☼









Southeast Alaska Thunderstorm Climatology

-By Jeff Wood

Although thunderstorms are not necessarily the first thing that comes to mind when you think about the weather in Southeast Alaska, they can develop here. They are capable of causing many problems when they do occur. Lightning and downburst winds pose many hazards, particularly with regard to marine vessels. Lightning can also ignite wildfires. Heavy rain can cause flash flooding, particularly in the mountainous terrain of Southeast Alaska. Hail, lightning, strong wind shear and turbulence in and around storms can significantly impact aircraft. (Wind shear is a change in wind speed and/or wind direction in a short distance resulting in a tearing or shearing effect. It can exist in a horizontal or vertical direction and occasionally in both.) Since all these dangers are of particular importance to this region, it is important to know about the frequency of thunderstorms as well as the time of year and conditions in which they are favored. This helps make us all more aware of them!

Southeast Alaska is a large area, stretching more than 300 miles from Yakutat to Ketchikan. Therefore, it should not be surprising that there can be variations in climate over such a large region. This is most definitely the case with the climatology of thunderstorms ***(please see graphs on page 2)***. Weather records from 1970 through 2001 at three stations: Yakutat, Juneau, and Annette Island were examined and thunderstorm days were noted. During the period, Juneau recorded a total of 16 storms, resulting in an average of one thunderstorm every 1.9 years. In this same period, Yakutat showed markedly greater activity with 95 thunderstorms, giving an average of 3.1 thunderstorms per year. The station at Annette Island near Metlakatla was in the middle, recording 62 thunderstorms - an average of exactly 2 thunderstorms per year. It is clear that both Yakutat and Annette Island have much greater thunderstorm activity than Juneau.

The close proximity of Yakutat to the open waters of the Gulf of Alaska allows for increased instability in the atmosphere which in turn is responsible for the larger number of thunderstorms found there. On the other hand Juneau, which is farther from the open ocean, is less prone to thunderstorms of this type since cold fronts from the North Pacific are generally stronger and more unstable near the outer coast. The thunderstorm activity that is found in Juneau is usually triggered by daytime heating and does not generally come in from off of the ocean, but up from the south or

even from the east over the Coast Range of northwest British Columbia. Annette Island falls in between the other two locations in that though it is not directly on the Gulf, it is exposed to the waters of the Dixon Entrance. This allows it to be affected by both of the major thunderstorm weather patterns.

The time of year also plays an important factor in the occurrence of thunderstorms in Southeast Alaska. Just as the number of storms varies across the region, so does the time of year during which these storms usually form. In Juneau, the summer months of June and July are the primary thunderstorm months. Daytime heating becomes intense enough to allow for the formation of thunderstorms. Yakutat on the other hand, finds its period of most intense thunderstorm activity in the fall, peaking between the months of September and the end of November. During this time, fall storms begin moving through the region. When a particularly cold region of air comes down out of the north toward Yakutat, it encounters the warmer waters and subsequently warmer air over the Gulf of Alaska. Since Yakutat is often at the interface between these two masses of air, it can receive several thunderstorms per year. At Annette Island, the peak time for thunderstorm formation was found to be August, when daytime heating allows for thunderstorms to form in a similar manner to Juneau. However, there is also a second peak similar to Yakutat's, that is delayed until later in November. This is most likely due to the fact that being located so far south, Annette Island stays warmer longer, so strong fall and winter fronts are delayed by about one month.

As you can see, even though Southeast Alaska does not experience as much thunderstorm activity as the lower 48 or even other parts of Alaska, they do develop in our region. This formation demonstrates considerable variability across the Panhandle in terms of the quantity of storms as well as the time during which they form. With a better understanding of when to expect thunderstorms, we are better equipped to deal with the dangerous hazards they create.☼

New Weather Observation Sites Coming to the Southeast Alaska Coastal Waters

-By Ed Plumb

Throughout the state of Alaska there are enormous areas with a lack of weather reporting stations. Due to the rugged coastline, which characterizes Southeast Alaska, there are considerable local variations in wind speed and direction throughout the region. Increased weather observations are especially important to vessels which are working, recreating or traveling through our local coastal waters. Observations are also extremely important to the weather forecasters at the National Weather Service (NWS). Forecasters need marine observations to diagnose weather conditions before they prepare forecasts and to verify their accuracy. Readings of atmospheric pressure, temperature, relative humidity, wind speed and direction are necessary pieces of information for the forecast process. This weather data is also used to initialize meteorological computer models. The more data that is available for the computer models, the better initial "snapshot" we get of the atmosphere. This in turn will lead to a better prediction of what weather patterns will develop in the future.

NOAA Coastal Buoy off Alaska

The majority of automated weather observing sites throughout Southeast Alaska are on land and generally are not representative of the conditions occurring over the open water. Friction tends to reduce wind speed over the relatively rough surface of the land. Some land-based observations are more representative than others, especially sites which are located on small islands in the middle of a channel, such as Eldred Rock in Lynn Canal or Five Finger Lighthouse in Frederick Sound. The best sources of continuous weather information over the open water are reports from buoys. Buoys not only report basic weather elements, but they also provide important oceanographic information such as sea surface temperature, wave heights and swell period. Mariners also supply valuable marine observations to the NWS by reporting weather and sea conditions from their vessels.

Several new observation sites will be installed this summer in order to fill in some of the holes in our marine observation network. A new land-based observation will be in operation on Sisters Island in the eastern end of Icy Strait by early July. This will be the only permanent marine observation site available in Icy Strait at this time. The NWS in cooperation with the US Coast Guard (USCG) and the National Data Buoy Center will be deploying two new buoys in the coastal waters offshore Southeast Alaska and the north Gulf Coast. This includes a new buoy southwest of Sitka Sound (#46084) and another south of Cape Suckling (#46082). The Cape Fairweather buoy (#46083), which was deployed in 2001, has been out of service since it was damaged during a storm late last fall. The USCG is scheduled to repair this buoy and install the other new ones in July. The addition of these buoys will provide the forecasters, as well as the marine community, with wind and sea conditions moving toward the coast of Southeast Alaska.

In order to continually improve our service to the marine community, the NWS is now including ship observations on the NOAA Weather Radio broadcast. These observations are identified by latitude and longitude. They typically include pressure, temperature, wind speed and direction. We hope that these additional observations will be beneficial to the Marine Community here in Southeast Alaska. Also, we hope that hearing ship observations over NOAA Weather Radio will encourage other vessels to provide the NWS with marine weather reports.

The expansion of our observation network will not only help improve forecasts, but it will also result in immediate updates to the marine forecast when observed conditions stray from the current forecast. Also, a higher concentration of observations will improve our understanding of the widely variable conditions encountered within the waters of Southeast Alaska. Stay tuned to NOAA Weather Radio to hear the weather observations broadcast from these new sites later this summer!☼

Have You Heard About Donna?

-By Laura Furgione

In August 2000, the National Weather Service set a goal for the improvement of the overall voice quality of the NOAA Weather Radio (NWR). This included all broadcast information (not just watches, warnings and advisories) without sacrificing the voice speed that translates the products for public safety.

The testing of the nationally developed Voice Improvement Processor is now complete. After months of evaluating the voice technologies and receiving public input, which included over 19,000 Internet survey comments, the new and improved voices have been selected. Donna and Craig are more understandable and human-sounding than the current voice. Their voices are created by combining concatenated, prerecorded phonetic sounds with the emphasis and intonation of a human voice. Coming this fall, the male voice, Craig, will be used for routine forecast products while the female voice, Donna, will be broadcasting warning information.

If you would like to check out the NWR voices and compare them to the old voice, please reference this link: http://205.156.54.206/nwr/newvoice.htm☼

The Latest On Our Unusually Dry Spring…

-By Chris Maier

A little over a month ago much of Southeast Alaska was in what was considered a "developing drought." Record clear and dry conditions in March and April caused some power generation shortfalls at our hydroelectric plants, increased the wildfire danger, stunted the growing season and hampered gardening efforts. From May into the first half of June, things improved as near normal precipitation occurred. In fact, during the first couple of weeks of June it has been abnormally wet.

So are we out of the woods yet? Is drought still a concern for Southeast Alaska? The answer can be found by looking at the numbers. The ***chart on page 6*** illustrates precipitation amounts for March, April and May. When you compare what has happened this Spring to what is normal it is clear that the northern half of the Panhandle is still being impacted by "abnormally dry" or developing drought conditions. In fact, from March 1 until May 31, it has been driest it has ever been (since weather data has been recorded) in the communities of Sitka, Yakutat, Juneau, Skagway and Haines. The southern half of the Panhandle (from about Frederick Sound southward) has received less precipitation than normal, but is not considered to be in developing drought conditions.

From this information it is clear that we still need to be concerned about any short term dry spells that might develop this Summer. Once Autumn arrives and the rainy season begins, things will improve. Until then, if we suddenly go a week or two without major rainfall, portions of the northern Panhandle (especially in the Haines and Skagway areas) could begin to see some "moderate" drought impacts. Some signs of "moderate" drought would include: damage to plants and crops; a high wildfire risk; streams, reservoirs or wells running low and causing some water shortages to develop.

Long range forecasts are for below normal precipitation in Southeast Alaska from late June into early August. That does not mean it will not rain during that time. What it does mean is that we are more likely to have a prolonged dry spell or two this summer. A week or two without any major rain. If that plays out we might be talking about the impacts of drought again soon.☼

Our precipitation this Spring when compared to weather record history				
Southeast Alaskan Community	Precipitation received this Spring (March 1-May 31)	Percent of Normal Precipitation	Driest it has ever been for this time period until now! (March 1-May 31)	Wettest it ever has been for this time period (March 1-May 31)
Juneau	3.90" ✹	**39%**	5.40" in 1967	19.20" in 1992
Skagway	0.60" ✹	**16%**	1.34" in 1967	7.03" in 1924
Haines	1.15" ✹	**17%**	3.77" in 1996	16.27" in 1956
Yakutat	8.38" ✹	**26%**	11.89" in 1954	55.69" in 1992
Sitka	5.73" ✹	**38%**	7.32" in 1989	31.91" in 1992
Petersburg	11.23"	56%	9.86" in 1989	28.25" in 1964
Ketchikan	20.40"	69%	10.54" in 1989	47.37" in 1966
Annette	12.98"	62%	8.12" in 1948	43.47" in 1959

✹ *indicates March 1 - May 31 this year was the* ***driest on record!***

Drought Defined

-By Chris Maier

Drought is a rare occurrence in the rain forest that is Southeast Alaska. The jet stream and our proximity to the Pacific Ocean keeps us under the influence of a Maritime Polar Airmass (cool, moist, and unstable air) most of the year. In other words, and as most of you know...it rains and snows a lot here.

The record dry spring across the northern half of the Panhandle has led to "Abnormally Dry" conditions or D0 drought. The farther north in the Panhandle you go...the drier it has been this Spring. If we have a prolonged dry spell this summer we could fall into "Moderate Drought" conditions or D1 drought. A good reference is all the wildfires that have been in the news this month in Colorado. That state is currently in "Extreme to Exceptional Drought" (D3 and D4). That is about as bad as it gets and probably only happens in Southeast Alaska every 300-500 years!

The National Drought Mitigation Center (NDMC) in Omaha, Nebraska monitors and defines drought throughout our country. NDMC is a cooperative institution between several Universities and Federal Agencies, including the National Weather Service. For more information check out their web site at http://drought.unl.edu/dm/monitor.html
Suffice it to say they are the experts on drought and here is how they define it:

Drought Severity Classification		
Drought Category	**Drought Description**	**Possible Drought Impacts**
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies

Fireworks for the 4th?

-By Chris Maier

Climate records are essentially the history of weather. A quick review of these records can provide insight into the weather one might expect for any given day of the year. ***The table below*** shows what typically happens on Independence Day for several communities in Southeast Alaska. Locations were selected based on the reliability of climate data. If your town is not listed you can assume weather records either do not exist or there simply was too much missing data.

From the data it is clear that high temperatures are usually in the 60s and low temperatures are generally in the 45-50°F range. The low temperatures can give you an idea of what to expect for midnight firework displays! The warmest and driest locations in the Panhandle tend to be the Skagway and Haines areas. The cool spot typically is Yakutat while the wettest town on the 4th tends to be Ketchikan. The last column on the table shows the chance of 'significant' rain on the 4th of July. This number is solely based on the climate record. For example, in Ketchikan rainfall greater than 0.05" occurred on July 4th in 28 out of the 56 years of the climate record. Therefore based on the historical weather record, there is a 50% chance for significant rain to dampen the Independence Day celebration in that community. Granted these numbers are not our official weather forecast for this 4th of July; but they can give us an inkling of what to expect! ☼

Climate data for the 4th of July in Southeast Alaska

Southeast Alaskan Community	Average High Temp	Record High Temp	Average Low Temp	Record Low Temp	Record Rainfall	Chance of significant rain (greater than 0.05")
Yakutat	60°F	79°F in 1951	46°F	36°F in 1954	1.19" in 1961	36%
Juneau	65°F	84°F in 1972	47°F	39°F in 1971	0.89" in 1964	29%
Skagway	69°F	87°F in 1972	48°F	36°F in 1984	0.25" in 1904	8%
Haines	68°F	84°F in 1972	50°F	43°F in 1954	0.27" in 1981	12%
Glacier Bay	64°F	76°F in 1972	46°F	41°F in 1984	0.31" in 1967	29%
Gustavus	64°F	83°F in 1951	47°F	33°F in 1984	0.64" in 1961	15%
Sitka	61°F	75°F in 1972	49°F	44°F in 1962	1.79" in 1961	33%
Port Alexander	65°F	76°F in 1997	47°F	42°F in 1952	1.50" in 1957	22%
Petersburg	64°F	80°F in 1968	47°F	37°F in 1962	0.94" in 1970	42%
Ketchikan	64°F	82°F in 1972	49°F	40°F in 1913	2.69" in 1957	50%
Annette	64°F	80°F 1972	50°F	45°F in 1977	1.05" in 1963	29%

WEATHER WATCHERS

Southeast Alaska's Spotter Network

-By Chris Maier

As your new Warning Coordination Meteorologist, it is my job to evaluate and improve our many programs here at the Juneau Forecast Office. This includes our Spotter Program. After reviewing our climate records, it is clear that our top weather hazards in Southeast Alaska are winter storms and high winds. They simply occur way more often here than any other types of severe weather. These other types of environmental hazards include: flooding, mudslides, avalanches, thunderstorms and lightning, waterspouts, wildfires, earthquakes, tsunamis and even volcanic ash fallout.

In the coming months I will be contacting each of you to get your thoughts on ways we can improve our Weather Spotter Program. I have already received ideas from a few of you. Thank you for that input as it is always greatly appreciated! It is my goal to implement some of these new ideas by the time that first major storm comes rolling in this autumn.☼

Our Most Active Spotter!

The National Weather Service forecast staff here in Juneau really appreciates your time and dedication as weather spotters. Let's face it, without your help our forecasts and warnings would suffer! Because your work means so much to us, each quarter we recognize our most active spotter with a special prize or award. This time our most active spotter was **Martha Reeves of Juneau** with 23 reports.

Martha will receive NOAA's guide to "Sea State, Wind and Clouds." This guide has some really cool images of cloud types as well as the Beaufort Wind Scale when applied to sea state.

Thanks Martha for your continued service as one of Southeast Alaska's best Weather Watchers! Congratulations!

Do you know someone interested in weather that is not a ***Weather Watcher?*** Let them know that becoming a weather spotter in Southeast Alaska is easy! You can browse through the training information on the web, we can mail you a course packet, or you can attend a short 2-hour spotter course. Courses may be scheduled in any community where there is enough interest to satisfy a minimal level of attendance (usually at least 10 people).

If you are interested in becoming a spotter or have some thoughts on how to improve our Spotter Program, please give us a call at (907) 790-6803 or e-mail Chris.Maier@noaa.gov. You will also find more information on our Spotter internet web page: ***http://pajk.arh.noaa.gov/spotter/spot.htm***

Don't Pollute My Air

-By Laura Furgione

Since 1998, there has been a growing concern that dust clouds and other various pollutants are affecting the United States. On four occasions during the first half of this past April, dust and air pollution from Mongolia and China reached the surface at the NOAA Climate Monitoring and Diagnostic Laboratory (CMDL) in Barrow, Alaska.

Dust storms have become a recurring problem for the Mongolian Plateau Zone. These events originate as west winds near 90 mph blow over the drier regions of Mongolia and China. As the particles travel toward the east coast regions of Asia, they entrain polluted air from these heavily industrialized areas. Mongolia and China can be plagued by dust storms for at least 40 days per year, and in some areas, for up to 100 days per year. While these clouds of dust disperse somewhat as they travel over the Pacific Ocean, they are visible in satellite images as large yellow and gray plumes. According to CMDL, the average transit time to Barrow is typically 6-8 days. For more information on air quality go to the CMDL site at http://www.cmdl.noaa.gov

Additionally, in an effort to track such significant environmental events, a team of NOAA scientists were organized to create newsworthy visible satellite data. This data is available on a web page called the Operational Significant Event Imagery http://www.osei.noaa.gov The site provides graphical information on events and areas such as fires, floods, icebergs, ocean currents, severe weather, snow cover, storms, tropical cyclones, hurricanes, typhoons, volcanoes and other unique imagery.☼

Southeast Alaska Summer Weather Trivia...

1. What was the hottest air temperature ever recorded in Southeast Alaska?
2. How about the hottest temperature ever recorded in all of Alaska?
3. What was the most rain ever measured in 1 summer day in Southeast Alaska?
4. What is the driest town in Southeast Alaska during summer?
5. What is the coldest Summer air temperature ever recorded in Southeast Alaska?

Welcome to our Office!

The Juneau Forecast Office has had the pleasure of welcoming a half dozen new employees over the past 4 months. Tracey Ress, our new General Forecaster, just arrived from Groton, Massachusetts. Previously she worked for a meteorological consulting company and also spent 8 years in the US Air Force. She has a B.S. degree in Meteorology from the University of Massachusetts.

Kimberly Vaughan is our new Hydro-Meteorological Technician. Kimberly began her National Weather Service career in 1998 at our office in Cold Bay. Most recently she was stationed at our Weather Service Office in Yakutat. Kimberly served for 9 years in the US Navy prior to joining the Weather Service. Her tours of duty included places like Illinois, Florida, Cuba and Texas. Kimberly is currently working on her degree in Environmental Science.

Aaron Jacobs is one of our new Meteorological Interns. He received a degree in meteorology from Penn State in the fall of 2002. Last summer he was a summer hire at the Forecast Office in Fairbanks where he developed his passions for hydrology and fire weather meteorology. He had never been to Juneau until he stepped off the Ferry in April. He and his dog (Mr. Halley) are excited to be here! They both love to spend time outside and enjoy the beautiful surroundings (backpacking, canoeing, fishing, etc...) Aaron is also an amateur photographer and mechanic.

Another new Meteorological Intern in our office is Julia Ruthford. She arrived from Seattle in March. She received degrees in Atmospheric Science and Physical Oceanography from the University of Washington in 1998. Since then she has worked as a Meteorological Technician for the USDA Forest Service, Pacific Northwest Research Station. This position allowed her the opportunity to serve as a part of the Fire and Environmental Research Applications team at the Seattle Forestry Sciences Laboratory. Julia loves the outdoors and is thrilled to be in Juneau. As an avid windsurfer and sailor, she can't wait to get out on the water. She is also enthusiastically looking forward to exploring the local mountains, glaciers and forests.

Last but not least, the Juneau Forecast Office is lucky enough to have two Summer Hires. This program allows college students the opportunity to gain valuable work experience in National Weather Service Offices during the Summer. J Sonner comes to us from the College of Charleston in South Carolina where he is working on dual degrees in Communications and Physics. Jeff Wood is a senior from Florida State University. He is working on a degree in Meteorology.☼

Tracy Ress

Kimberly Vaughan

Aaron Jacobs

Julia Ruthford

Triv ia Answers: (1) 98°F in Haines 7/31/1976 (2) 100°F in Fort Yukon 6/27/1915 (3) 10.99" in Little Port Walter 9/19/1978 (4) Skagway with an average of 6.11" of precipitation for Summer (June 21-Sep 22) (5) 22°F in Gustavus 9/13/1984